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ABSTRACT

To determine whether the equality of educational opportunity increases in proportion to the rapid expansion of a national school system, questionnaire response data from 1957 to 1962 Danish higher education graduates were analyzed. Social inequality was defined as the relationship between social origin and educational potential. Data analysis confirmed that despite a marked increase in the number of students attaining higher education in Denmark, no change had occurred in the social inequality of education. The relationship between social origin and educational potential was inferred by applying a stochastic process model in which the educational potential was assumed to govern the outcome. (Author/JK)

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EQUALITY OF EDUCATIONAL OPPORTUNITY IN AN EXPANDING EDUCATIONAL SYSTEM

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ABSTRACT

In this paper educational careers are conceptualized as a function of the educational structure and a set of individual characteristics, that comprises an individual's educational potential. Social inequality of education is defined in terms of the relationship between social origin and educational potential. Using this definition, it is shown that despite a marked increase in the number of students attaining higher education in Denmark, no change occurred in the social inequality of education. The relationship between social origin and educational potential is inferred by applying a stochastic process model in which the educational potential is assumed to govern the outcome.

A marked growth in the number of students in higher levels of education has been a phenomenon common to most industrialized societies in the sixties. It is tempting to assume that this growth reflects a decrease in the inequality of educational opportunity. By necessity, it seems, the increased attendance to higher levels of education should be accompanied, if not caused, by a decrease in the influence of family background on educational opportunity.

This paper will argue that this is not necessarily so: an increased attendance to higher education does not preclude an unchanged or even increased inequality of education. It will furthermore be shown that at least in one instance, the expansion of the Danish educational system in the beginning of the sixties, empirical data indicates an unchanged effect of family background on educational opportunity, despite a drastic increase in the number of students seeking higher education.

As may be expected, the argument hinges on the definition of inequality of education. The following sections are focussed on arriving at such a definition. The conceptualization of the factors determining educational attainment used here is similar to the one used in studies of social mobility, and may be of interest regardless of the specific problem treated here. It is, therefore, discussed at some length.

The data presented are taken from a study of educational careers of Danish students (Sørensen, 1967). Two cohorts of students graduating from the "gymnasium" (the highest secondary school level in Denmark) in 1957 and 1962 were questioned on their educational careers up to and after graduation.[1] The sample consists of half the 1957 cohort and one-fourth of the 1962 cohort. The two time points reflect vividly the expansion of the Danish educational system; the number of graduates doubled in this period. The instrument was a mailed questionnaire and the response rate was 80%. Non-response was not significantly correlated with major variables, such as family background and grades. The non-response partly reflects the difficulties encountered in obtaining the present address of students on the basis of their 1957 or 1962 addresses.

Determinants of Educational Attainment

The outcome of an educational career, as for example, completion of higher education, can be seen as a result of the interplay between two sets of characteristics: the structure of the educational system, and individual characteristics. Structure refers to the number of positions or places in different educational elements, and the relationships between these elements. By the relationships between educational elements is meant the set of requirements instituted in an educational system for passing from one educational element to another; for example, the requirements governing mobility from one grade to another or from high school to college.

Marked contrasts can be found between national educational systems with respect to educational structure, both in terms of the number of po-

sitions on different educational levels, and in the routes to these levels. The contrast between strongly selective European systems and the American system is a case in point.

Given the educational structure, attainment of an educational level involves a desire to obtain that level, an academic performance satisfying the intellectual demands encountered, and sufficient economic and social resources to satisfy the non-intellectual demands involved in attaining the particular level of education. Hence, what may be termed <u>educational potential</u> has three components: (1) level of educational aspirations; (2) achievement capacity, involving intelligence, creativity, and motivation to achieve; and (3) socioeconomic capacity; that is the economic capacity of students and/or parents, and the student's ability to behave in accordance with prevailing norms and values of the educational system.

It is well documented that all three components of the educational potential depend on the social environment in which the student grows up. In the sociology of education, this environment is most often indexed by some characteristic of the student's family background (such as its socio-economic status), or by some characteristic of the student himself (such as his sex), or by the student's peers.

It is important to notice that the educational potential is not a fixed quantity over time, but will change according to the student's educational and other experiences. The educational structure may be important for the development of the educational potential. There are indications that an early screening of the academically talented may increase the variation in educational potential and strengthen the effect of family background (Husen, 1967; Douglas, 1964).

Definition of Social Inequality of Education

The conceptual apparatus outlined suggests the following definition of educational equality:

The degree of social inequality in education, according to a given background factor, is equivalent to the strength of the relationship between this background factor, and the educational potential.

In other words, if an indicator on a student's social background shows no relationship to educational potential, then we will say that equality of education prevails with respect to the aspect of the student's origin indexed. The stronger the relationship, on the other hand, the greater the inequality.

Defining social equality of education in terms of educational potential has the advantage of enabling comparisons of inequality of education over time or over places, independently of variations in educational structure. Since attainment is a function of the educational potential and the educational structure, comparisons of the relationship between social background and attainment are hindered by variations in educational structure. At least the number of positions on different educational levels ordinarily changes over time and the relationship between educational elements generally are not the same in different nations. That the number of university students from lower class origins goes up over time may reflect an increase in the number of university places only, and does not by itself indicate a decrease in social inequality of education from the present viewpoint.

Relating measures of the various components of educational potential to indices of social environment is an important task in the sociology of learning. For comparisons over time or places, this practice has obvious drawbacks. Measures of achievement, essential for measuring educational potential, are not easily compared from one place to another or over time.

Another approach to inferring the relationship between educational potential and social origin is to assume a distinct functional relationship between educational attainment and educational potential. Granted the validity of this assumption, the effect of an indicator of the social origin on educational potential can be established from the relationship between attainment and origin. This is the approach to be followed here. The model used to infer the relationship between social origin and educational capacity is a stochastic process model developed by Coleman (1964).

The Setting

The Danish school system is organized in three levels[2] beginning with a primary school of five years for all. After the fifth grade, those who are deemed academically talented and have the desire, are selected for the "middle school;" the remainder must stay in school until age 14. Most stay a year or two longer. The middle school is completed after four years with an examination on the basis of which the graduates either take an additional year of schooling and obtain a diploma, qualifying him for many middle level business and technical jobs, or they may

apply for the gymnasium. The gymnasium is a three-year course with the goal of preparing the students for higher education. A successful completion of the gymnasium qualifies the student for studies at the universities or other institutions of higher learning. At the university there is no further restriction on admission, whereas at some of the other institutions (School of Dentistry, Technical University), admission is dependent on the grades obtained in the gymnasium.

The completion of the gymnasium seems comparable to the second year of college in the United States, only a much smaller proportion of an age cohort obtain this level. This is shown in Table 1, which also illustrates the growth in this category of students.

Table 1. Number of persons graduating from the gymnasium 1950-65, and corresponding rates of attainment

Year	Number of Graduates	Graduates in % of 19 Year Olds
1950	2627	4.5
1955	3132	5.0
1957	3682	5.7
1960	4433	6.6
1962	6364	7.9
1964	7835	8.6
1965	8958	9.0

Source: Statistisk Aarbog 1931-66 (Statistical Yearbook 1931-66). Statistisk Department, Copenhagen, 1932-66.

The growth in the absolute number of graduates reflects the impact of both a rise in the birthrate in the forties, which peaked in 1946, and an increase in the proportion of a cohort obtaining this level of education. The total effect is a drastic increase in the number of positions on this educational level, larger than any observed before. The rate was 1½% at the turn of the century.

Graduating From the Gymnasium

As an indicator of the social origin, the father's social status, measured primarily by his occupational prestige, is used. The operationalization of father's social status follows closely the one outlined by Svalastoga (1959) in his study of social stratification and mobility in Denmark. This procedure leads to placement in one of nine social strata, roughly equidistant in occupational prestige.

The composition of the two cohorts of students in terms of father's social status is shown in Table 2. (See page 8.)

The change from 1957 to 1962 is modest: a lower proportion of students come from stratum 1-5 (middle-middle class and above) in 1962, and correspondingly a higher proportion come from stratum 6-8 (lower-middle and working class).

The social composition of the student body is more like the composition of the whole population in 1962 than in 1957. It is, therefore, tempting to draw the conclusion that social inequality of education has decreased in the period, and many would probably concur with that conclusion.

Table 2. Graduates from the gymnasium 1957 and 1962 according to father's social status and the distribution of whole male population according to social status.

Father's Social Status	Students 1957 %	Students 1962 %	Male Population 21 Years and Older 1953-54 %
1-3	6.8	4.8	0.3
4	28.1	27.9	2.7
5	26.3	23.4	10.2
6	28.9	33.1	25.8
7	7.1	7.8	34.4
8,9	2.8	3.0	26.6
	100.0	100.0	100.0
NA	11	6	-
N	1181	1126	(3032)

Source: Svalastoga, K. "Prestige, Class and Mobility," Copenhagen, 1957; p. 142.

Note: In this table and in Table 3, students graduating from evening courses, etc. are excluded.

Our definition of social inequality of education given above defined this concept in terms of the relation between social origin and educational potential. It is impossible to infer from Table 2, as it stands, whether a change has occurred in this relationship.

The social composition of the student body is a product of the attainment rates in different social strata and the sizes of these strata. A change in the relation between social origin and educational potential would be reflected in changes in the attainment rates for different social strata. It is, therefore, natural as a next step in the analysis to compare these attainment rates.

A comparison of the attainment rates in the two years is possible if it is assumed that there was no change in the relative sizes of the different social strata in the period. Such a change could account for some of the variation in social composition of the student body, but cannot be described with the data at hand. Given the short time span, it seems reasonable, however, to make the assumption of no change in the relative size of the social strata. With this assumption it is possible to estimate the attainment rates in different social strata, using Bayesian probabilities.

If the probability of graduating from the gymnasium, given origin in a certain social stratum, is denoted P(G|S), it follows that:

Eq. 1 $$P(G|S) = \frac{P(GS)}{P(S)}$$

but

Eq. 2 $$P(GS) = P(S|G) \cdot P(G)$$

hence

Eq. 3 $$P(G|S) = \frac{P(S|G)\ P(G)}{P(S)}$$

P(S|G) is the probability of being from a certain social stratum given that a person is a graduate from the gymnasium. These probabilities are given in Table 2. P(G) is the probability of graduating from the gymnasium, given in Table 1. P(S) is the probability of being born in a certain social stratum. This probability is not known, so the distribution of the whole male population given in Table 2 shall be used as an approximation. This estimate is biased to the extent that birth and mortality rates vary with social stratus. The bias introduced, however, is probably not large enough to invalidate the comparison between the two cohorts.

Table 3. Rate of attainment in each social stratum, 1957-1962.

Father's Social Status	Rate of Attainment	
	1957 %	1962 %
1-3	(100.0)	(100.0)
4	53.0	73.1
	59.2	76.9
5	12.7	16.3
6	5.6	9.0
7	1.1	1.6
8,9	0.6	0.8
Overall	5.1	7.2

Table 3 does not clearly support the conclusion that might have been drawn from Table 2 regarding the change in social inequality. The rates of attainment have gone up for all social strata in the period from 1957 to 1962. Thus, all strata have benefited from the increase in the number of places in the gymnasium. It is difficult from Table 3 to ascertain whether the increase in the rates of attainment are uniform for all social strata or not, since the comparison of the rates is hampered by the ceiling effect produced by the finite number of children in each social stratum. Only if the rates of attainment changed differentially could a change be inferred in the relation between social origin and educational potential; that is, a change in the social inequality of education. A more direct measure of the relation between social origin and educational potential is needed.

If it is assumed that a stochastic process gives a valid description of the educational process, then Table 3 provides data for a direct test of whether a change in the relation between social origin and educational potential has occurred. The model used is one developed by Coleman (1964, Chapter 8) called: "A one-way process with a continuous independent variable." In this model, we shall assume that the educational potential governs the process, and the model then can be developed as follows.

Suppose that at any small time interval, dt, in the educational process a person has a probability q of shifting from the state "will graduate from the gymnasium" to the state "will not graduate from the gymnasium;" it then follows that

Eq. 4
$$\frac{dn_2}{dt} = q(n-n_2)$$

where $\underline{dn}_2$ is the increase in the number of individuals who will not graduate from the gymnasium; $\underline{n}$ is the total number of individuals at the outset; and $n-n_2 = n_1$ is the number remaining in the state "will graduate."

We shall assume that equation 4 governs the process in each social stratum. The probability $\underline{q}$ is a direct, but inverse, measure of educational potential for individuals born in a certain social stratum. This probability can be taken as linearly dependent on social status,

Eq. 5 $$q = a + bx$$

The parameter $\underline{b}$ is a measure of the effect of social status on the educational potential. This parameter, therefore, gives us a measure of the inequality of education according to the definition presented above.

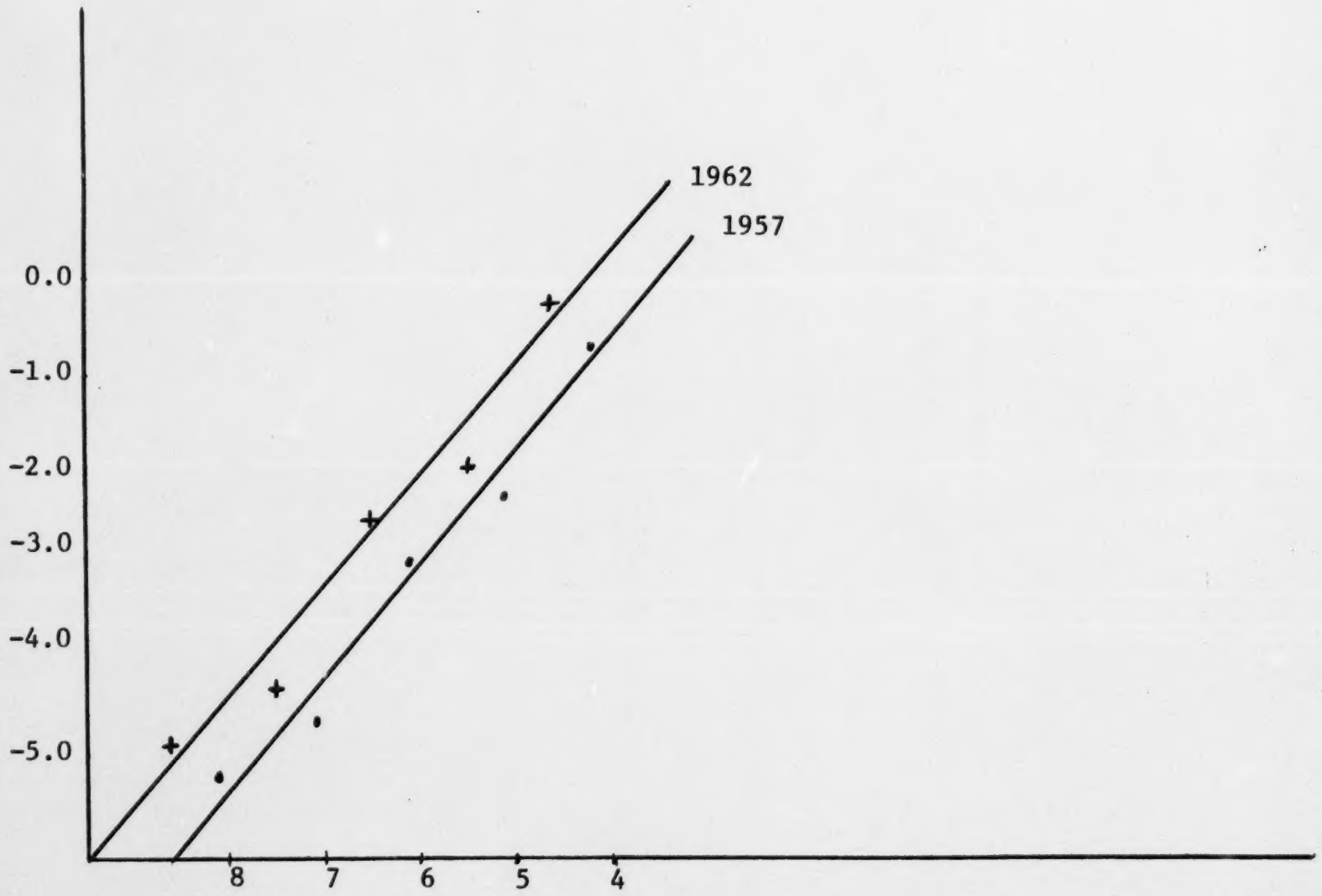
Integrating equation 4 and inserting equation 3 gives:

Eq. 6 $$\log \frac{n - n_2}{n} = (\log \frac{n_1}{n}) = - (a + bx)t$$

Since t is the same for all persons, a linear relationship is expected between father's social status and the logarithms to the attainment rates. Plotting the logarithms to the rates given in Table 3 against social status gives a graphic test of the model, presented in Figure 1. (See Figure 1 on page 13.)

The social strata, as delineated by Svalastoga (1959), are roughly equidistant in social status. From Figure 1 it seems that the expected linear relationship holds, especially considering the metric properties of the independent variable.

Figure 1



The slope of the line relating log $\underline{p}$ and social status appears from the graph to be the same in the two years. This impression is confirmed by a least square estimate of the slope and intercept; that is, the parameters $\underline{a}$ and $\underline{b}$ in equation 4.

	slope	intercept
1957	1.140	3.803
1962	1.135	4.111

It seems safe to conclude that no change can be ascertained in the effect of social status on educational potential. The difference in the intercepts, on the other hand, reflects the overall increase in the attainment rates.

Granted the validity of the model, it appears, therefore, that no decrease in the social inequality of education occurred in the period. All social strata profited equally from the marked increase in the number of educational positions in this educational level (this was nearly a 100% increase, as shown in Table 1).

The change in the social composition of the student body shown in Table 2 gave an impression of greater equality of education. In view of the above result, this change can be explained by the ceiling effect. An overall increase in the attainment rate is bound to lead to a decreasing in the proportion of students coming from the upper social strata, since there are very few children left who were not already graduating.

The above result will be commented upon further in the conclusion. Before that, it seems appropriate to analyze the next phase of the educational career for the graduates from the gymnasium: their choice of further study.

Social Origin and Choice of Further Education

The choice of further education reflects the operation of only one component of the educational potential: the level of aspiration. This component is probably the one most dependent on the actual experiences of the student at the time of graduation. It is very difficult to predict the development in this phase of the educational career from the above results. These results referred to the cumulative effect of social origin on educational potential.

It is, nonetheless, of interest to compare the educational choices of the two cohorts. The conditions for further study were markedly different at the two times. The general welfare and wealth of Danish society increased markedly in this period, and it was especially important for students in higher education that public financial aid to students was raised from 19 million Danish kroner to 71 million Danish kroner in 1961.

Although social origin can be expected to have a small effect on the choice of study for this highly select group of students, a comparison of the two cohorts illustrates the extent to which better economic conditions in fact affected the influence of social origin. A positive effect of better economic conditions would be consistent with widely held beliefs concerning the cause of social inequality of education.

Table 4. Students 1957 and 1962 according to level of education entered.

Level of Education	Students 1957	Students 1962
1. Higher Education	57.2	66.6
2. Other Studies (2-5 Years)	33.5	28.1
3. Other Studies (½ - 2 Years)	5.8	3.6
4. No Further Education	3.5	1.7
	100.0	100.0
NA	0	13
N	1306	1264

As shown in Table 4 above, there was a general increase in the proportion of graduates who began higher education; that is, graduates who pursued study at the university or any of the other institutions of higher learning. This category includes all students who began study for a profession, for teaching in the gymnasium, and for a university career.

This increase in the rate of attendance together with the growth in the absolute number of students created rather catastrophic conditions, especially at the universities in the sixties. The other levels of education which received a relatively smaller share of the students in 1962 includes teacher training, nursing, etc.

It can be shown that the student's sex is very important in the choice of future study, and that the grades in the gymnasium play a role,too. In Table 5, sex and grades are taken together with father's social status as independent variables in relation to the proportion of students who chose a higher education in the two years. (See Table 5, page 18.)

The effect parameters are estimated using Coleman's model for multivariate analysis (Coleman, 1969). The most marked change in the period is a reduction in the effect of sex. The effect of father's social status seems unchanged, and if anything, slightly higher. The difference is not significant, however.[3] The better economic conditions, hence, did not change the effect of social origin on the choice of further study.

The changing effect of sex may be attributable to the better economic conditions, however. Starting a higher education is a risky endeavor for women in terms of probability of completion. It is reasonable to assume that the risk is taken most often when the cost of the investment goes down.

Table 5. Proportion of students beginning higher education according to sex and grades at final examination in gymnasium and father's social status.

Grades		High		Low	
Father's Social Status		High	Low	High	Low
Males:					
1957	%	90.4	84.0	75.3	62.1
	N	123	266	113	219
1962	%	94.5	82.0	76.1	72.5
	N	108	236	109	277
Females:					
1957	%	48.4	40.6	28.6	21.5
	N	91	160	105	214

Note: High social status: stratum 1-5
Low social status: stratum 5-8
High grades: "mg" and above
Low grades: below "mg"

	1957	1962
Effect of sex:	.437	.284
Effect of grades:	.190	.170
Effect of father's social status:	.086	.104
Effect of other factors:	.210	.392

Conclusion

It has been shown that despite a 40% increase in the proportion of a cohort that graduated from the highest secondary school level in Denmark, and a nearly 100% increase in the absolute number of students, no change took place in the degree of social inequality of education. No changes occurred either in the effect of social origin in the choice of further study, despite markedly better economic conditions toward the end of the period. The distance between social classes in terms of educational potential, in other words, remained the same.

One explanation for the observed phenomena could be the stability in an important characteristics for the educational career--the highly selective route to higher education in Denmark, described earlier. In fact, this aspect of the educational structure has remained the same in Denmark since 1903. It is significant, therefore, that the proportion of students from working class origin went from 1% to 4.2% from 1903 to 1920, but then remained nearly unchanged until the end of the fifties, when it was 6.5%.[4] Such stability is consistent with a hypothesis attributing the lack of change in educational equality to the educational structure. A major instrument of change in educational inequality, consequently, should be the organizational differentiation of students; that is, the modes of grouping and selection in an educational system.

NOTES

[1]The study was conducted for the Danish Ministry of Education at the Institute for Organization and Industrial Sociology, Copenhagen School of Economics and Business Administration in 1964-1966. The data collection took place in the beginning of 1965.

[2]A reform enacted in 1957 replaced the selection for "middle school" at the fifth grade by a streaming in 6th and 7th grades. None of the students dealt with here has followed that system.

[3]The standard deviations of the estimates of the effect parameters are computed using the procedures suggested by Coleman (1964, p. 205). Using the normal approximation, we get a normal deviate for the difference between the estimates of $z = 1.01$, $p < 20$.

[4]"Bømesholen 1913" and later issues; Statistiske Meddelelser (Statistical Bulletin), Statistisk Department, Copenhagen, 1913.

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EQUALITY, OF EDUCATIONAL OPPORTUNITY IN AN EXPANDING EDUCATIONAL SYSTEM

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In this paper educational careers are conceptualized as a function of the educational structure and a set of individual characteristics, that comprises an individual's educational potential. Social inequality of education is defined in terms of the relationship between social origin and educational potential. Using this definition, it is shown that despite a marked increase in the number of students attaining higher education in Denmark, no change occurred in the social inequality of education. The relationship between social origin and educational potential is inferred by applying a stochastic process model in which the educational potential is assumed to govern the outcome.